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Date: 4/26/2024

ENGR HW #9

Question 1:

% Constants

a = 26.78;

b = 0.014831;

c = -0.000007205;

d = .000000001317;

t1 = 25 + 273.15; % Converted to Kelvin

t2 = 120 + 273.15; % Converted to Kelvin

% Heat capacity function

Cp = @(T) a+b\*T+c\*T.^2+d\*T.^3;

% Integral - Part (a)

H = integral(Cp, t1, t2);

% Part (b)

x = linspace(t1, t2, 96);

trap = trapz(x, Cp(x));

% Part (c)

% Int

integral\_H = double(integral(Cp, t1, t2));

% Analytical

analytical\_H = a\*(t2-t1) + (b/2)\*(t2^2-t1^2) + (c/3)\*(t2^3-t1^3) + (d/4)\*(t2^4-t1^4);

% Display in short engineering format in table

format shortEng;

disp("integral      trapezoid      int      analytical");

fprintf('%%.4e      %%.4e      %%.4e      %%.4e\n', H, trap, integral\_H, analytical\_H);

```
>> enthalpy
integral              trapezoid              int              analytical
2.9541e+03              2.9541e+03              2.9541e+03              2.9541e+03
fx >>
```

Question 2:

a)

Command Window

```
>> syms t y(t)
>> ode = diff(y, t) == t^2 + 5*t + 1

ode(t) =

diff(y(t), t) == t^2 + 5*t + 1

>> solution = dsolve(ode, y(2)==1)

solution =

(t*(2*t^2 + 15*t + 6))/6 - 41/3

>> pretty(solution)
      2
t (2 t  + 15 t + 6)  41
----- - ---
      6              3
```

```
>> y2 = subs(solution, t, 2)

y2 =

1

>> y10 = subs(solution, t, 10)

y10 =

1739/3

>> result = y10-y2

result =

1736/3

fx >>
```

Clipboard		Font			
C87	:	$\times$ $\checkmark$ $f_x$	$= (C84 - C85) / C85$		
	A	B	C	D	E
54	7.2	88.84	8.7875		
55	7.3	90.79	8.9815		
56	7.4	92.76	9.1775		
57	7.5	94.75	9.3755		
58	7.6	96.76	9.5755		
59	7.7	98.79	9.7775		
60	7.8	100.84	9.9815		
61	7.9	102.91	10.1875		
62	8	105	10.3955		
63	8.1	107.11	10.6055		
64	8.2	109.24	10.8175		
65	8.3	111.39	11.0315		
66	8.4	113.56	11.2475		
67	8.5	115.75	11.4655		
68	8.6	117.96	11.6855		
69	8.7	120.19	11.9075		
70	8.8	122.44	12.1315		
71	8.9	124.71	12.3575		
72	9	127	12.5855		
73	9.1	129.31	12.8155		
74	9.2	131.64	13.0475		
75	9.3	133.99	13.2815		
76	9.4	136.36	13.5175		
77	9.5	138.75	13.7555		
78	9.6	141.16	13.9955		
79	9.7	143.59	14.2375		
80	9.8	146.04	14.4815		
81	9.9	148.51	14.7275		
82	10	151	14.9755		
83					
84		Sum =	578.68		
85		Matlab ODE =	578.6666667		
86					
87		% Error =	0.0023%		
88					
89					
90					

b)